

**Notic of Allowability**

Application No.

09/935,012

Examiner

Delma R. Flores Ruiz

Applicant(s)

COLDREN ET AL.

Art Unit

2828

**-- The MAILING DATE of this communication app ars on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 3/22/2004.
2. ☒ The allowed claim(s) is/are 1-3,5-18,20-32 and 34-46.
3. ☒ The drawings filed on 12/10/2001 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All b) ☐ Some\* c) ☐ None of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

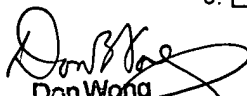
Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) f each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

  
Don Wong  
Supervisory Patent Examiner  
Technology Center 2800

## DETAILED ACTION

### ***Allowable Subject Matter***

The following is an examiner's statement of reasons for allowance: claim 1 has been allowed over the prior art because they fail to teach a distributed Bragg reflector for use in a vertical cavity surface emitting laser, comprising **a group of layers of semiconductor material doped to reduce voltage drop and optical loss in a vertical cavity surface emitting laser, the group of layers further including alternating layers of an InP compound approximately lattice-matched with layers comprising  $Al_aGa_{1-a}As_bSb_{1-b}$  where "a" and "b" indicate relative proportions of atoms.**

The following is an examiner's statement of reasons for allowance: claim 12 has been allowed over the prior art because they fail to teach a device for reflecting light to an active region in a vertical cavity surface emitting laser, comprising: **a mirror portion including the element antimony (Sb) and an indium phosphide (InP) compound epitaxially grown on a substrate wherein in the mirror portion there are a group of**

**layers, the group of layers further including alternating layers of an InP compound approximately lattice-matched with layers comprising  $Al_aGa_{1-a}As_bSb_{1-b}$  where " a " and "b" indicate relative proportions of atoms, and wherein electric current is pumped through the group of layers forming the mirror portion to electrically pump the active reson.**

The following is an examiner's statement of reasons for allowance: claim 17 has been allowed over the prior art because they fail to teach a vertical cavity surface emitting laser, comprising: a pair of mirror portions epitaxially grown on a substrate, the pair of mirror portions including a group of layered stacks of paired semiconductor material, wherein the pair of mirror portions are n-doped to reduce voltage drop and optical loss; **the group of layered stacks in each of the mirror portions further including alternating layers of an InP compound approximately lattice-matched with layers comprising  $Al_aGa_{1-a}As_bSb_{1-b}$  where " a " and "b" indicate relative proportions of atoms: an active region epitaxially grown on the substrate and positioned between the pair of mirror portions; a doped tunnel junction configured to provide electron-hole conversion from one of the pair of mirror portions; and wherein the pair of mirror portions, the active region, and the tunnel junction are epitaxially grown on the substrate in a single step, and wherein electric current is pumped through the pair of mirror portions to electrically pump the active region.**

The following is an examiner's statement of reasons for allowance: claim 31 has been allowed over the prior art because they fail to teach a vertical cavity surface emitting laser comprising: a substrate on which a pair of mirror portions, **an active region and a tunnel junction are epitaxially grown in a single step in which semiconductor elements are deposited to form a multi-layered structure; the multi-layered structure in each of the mirror portions further including alternating layers of an InP compound approximately lattice-matched with layers comprising  $Al_aGa_{1-a}As_bSb_{1-b}$  where "a" and "b" indicate relative proportions of atoms at least one metal contact disposed on the substrate, wherein electric current is pumped through the pair of mirror portions to electrically pump the active region.**

The following is an examiner's statement of reasons for allowance: claim 43 has been allowed over the prior art because they fail to teach a distributed Bragg reflector for use in a vertical cavity surface emitting laser, comprising **a group of layers of semiconductor material to increase thermal conductivity in a vertical cavity surface emitting laser, the group of layers further including alternating layers of an InP compound approximately lattice-matched with layers comprising  $Al_aGa_{1-a}As_bSb_{1-b}$  where "a" and "b" indicate relative proportions of atoms.**

Claims 2 – 3, 5 – 11, 13 – 16, 18, 20 – 30, 32, 34 – 42, and 44 – 46 has been found allowable due to their dependency on claims 1, 12, 17, 31, and 43.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reason for Allowance".

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Delma R. Flores Ruiz whose telephone number is (571) 272-1940. The examiner can normally be reached on M - F.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Don Wong can be reached on (571) -272-1834. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.


Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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For more information about the PAIR system, see <http://pair-direct.uspto.gov>.

Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Delma R. Flores Ruiz  
Examiner  
Art Unit 2828

  
Don Wong  
Supervisor Patent Examiner  
Art Unit 2828

DRFR/DW  
June 8, 2004